

Confidently Accessing Research in a Turbulent Time

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The task I undertake here is not to reveal sinister, external enemies of the scholarly enterprise. I will examine the insidious, largely ingrown, practices that have turned our most useful tool for sharing the fruits of our research, the scholarly communications system, into a bit of a mess. I begin with an overview of how we got to this point.

Development of the Scholarly Communications System

Scholarly communications began when the first persons who considered themselves to be scholars spoke about their fields of expertise. Perhaps that first communication was from Eve to Adam on the results of her research into the hidden nature of fruit.

The oral characteristic of that first imagined conversation continued until writing was invented and the scholar perhaps wrote a few notes on the systematic relationship of the radius of a circle to its circumference so that another colleague could benefit from that insight.

The largely one-to-one oral/written nature of early scholarly communications was corrupted from time to time when oral communications were passed to others and letters circulated to interested parties. We all know how person to person communication gets corrupted after a few transmissions. Unless scribes are most careful, the same happens in the copying of complex letters and texts. Worse than error occurs when the transmitter decides to slightly improve upon or embellish the work of the scholar.

Guttenberg's press appeared to be the solution to this problem of corruption. Simply fix in print the scholars' words and the corruption of the work is eliminated. But it seems that the early press lords were keener on making a buck than preserving scholars' words. Flaming distortions sold far better than somber truths.

The trustworthiness of scholarly communications is well described by Adrian Johns in his 1980 piece in the *British Journal of the History of Science*¹. To illustrate the level to which communications fidelity had fallen by the early 1600s he quotes John Rushworth, an assistant to Parliament's clerk, who expressed most clearly the experience of living in this world: "*Mens Fancies were more busie than their Hands, Rushworth attested, forging Relations, ...publishing Speeches as spoken in Parliament, which were never spoken there; Printing Declarations which were never passed, relating Battels which were never fought, and Victories which were never obtained; [and] dispersing Letters which were never writ by the Authors.*"²

In an environment in which one's words were misrepresented, altered and mangled, scholars tried to tightly control the distribution of their findings. Letters were provided only to trusted collaborators and presentations were made to closed groups. In short, the growing inability to be confident of having one's work faithfully represented led to less distribution of a scholars work than needed for the rapid development of science.

To counter this trend, John Rushworth collected eight vast volumes³ of authoritative records beginning with the *Historical Collections of Private Passages of State: Volume 1, 1618-29*. Rushworth's description, "*Their contents 'concredited' by cross-references and endorsements, these tomes would serve to 'separate Truth from Falsehood, things real from things fictitious or imaginary'. [And John's concludes,] the experience of epistemic insecurity thereby gave rise directly to what remains today one of historians' major resources for the period.*"⁴

But Rushworth's assurance solution was for State papers only and came after documents were produced, providing no assurance to scholarly authors hesitant about sharing new results.

As is well known, the Royal Society in 1665 began *Philosophical Transactions* to encourage scholars to share. "*The Society had already instituted a 'register' to recount discoveries to their proper contributors. . . The Transactions was to be its accessible equivalent: the public register of the virtuosi. . . intended to become the international incarnation and emblem of experimental achievements, at once authoritative and irenic. It would extend that civility into national and international arenas which, despite the common*

¹ Adrian Johns, *Miscellaneous methods: authors, societies and journals in early modern England BJHS*, 2000, **33**, 159–186

² Ibid. p. 161

³ J. Rushworth, *Historical Collections of Private Passages of State*, 8 vols., London, 1680–1701,

⁴ Adrian Johns, op. cit. 161

representation of a 'republic of letters', were prone to fierce and debilitating dispute." ⁵

"... the periodical soon achieved acceptance as a medium for securing priority in discoveries, and for manifesting authorship without incurring aspersions of immodesty. Continental philosophers and mathematicians came to trust to its propriety surprisingly quickly, and soon began to send contributions for its pages. To that extent, success was rapid and real."⁶

Philosophical Transactions and its French sister, *Journal des Sçavans*, which both appeared in 1865, hinted at the broad revolution in scholarly communications to come. But both publications had interrupted publication histories, the plague and financial difficulties tripping *Transactions* and the French Revolution disrupting *Sçavans*, but by the early 1800s, both were reliable outlets.

Progress in the growth of societies and their scholarly journals was steady.

- 1731-*Medical Essays and Observations*, the first fully peer-reviewed journal, by the Royal Society of Edinburgh;
- 1743-The American Philosophical Society, the first scholarly society in the US, is created;
- 1848-The American Association for the Advancement of Science is founded.;
- 1869-*Nature* publishes its first issue;
- 1880: *Science* publishes its first issue.⁷

Growth thereafter has been predictable "*The number of peer reviewed journals published annually has been growing at a very steady rate of about 3.5% per year [from the late 1600's to the present]*".⁸ During this period researchers and the public have grown to depend upon scholarly journals to serve 5 functions:

- Registration: third-party establishment by date-stamping of the author's precedence and ownership of an idea;
- Dissemination: communicating the findings to its intended audience usually via the brand identity of the journal;
- Certification: ensuring quality control through peer review and rewarding authors;
- Archival record: preserving a fixed version of the paper for future reference and citation;

⁵ Ibid. p. 165

⁶ Ibid. p167

⁷ Ben Mudrak "Scholarly Publishing: A Brief History" *History forum, AJE Scholar*
<https://www.aje.com/en/arc/scholarly-publishing-brief-history/>

⁸ Mark Ware and Michael Mabe "*The STM Report: An overview of scientific and scholarly journal publishing*"
March 2015 p. 27

- Navigation: “providing filters and signposts to relevant work amid the huge volume of published material.”⁹

Ferment and Change

But three landmark journal publishing developments presaged significant changes to what had become a settled and largely trusted scholarly communications system.

- **1947:** Elsevier, a huge Dutch commercial publisher, produced its first international journal, *Biochimica et Biophysica Acta*.
- **1990:** *Postmodern Culture* becomes the first online-only journal with no printed version available
- **1991:** *arXiv*, the science pre-print server, was launched.¹⁰

Elsevier’s entrance was the narrow end of the broad wedge of entry into scholarly communications by publishers whose primary motivation was profit-making rather than simple facilitation of scholarly progress. Elsevier’s 1947 entry led to a profusion of commercial firms in the 1960s as the space race and “big science” fostered rapidly expanding university research expenditures and scholarly findings.

Commercial publishers now produce about one-half of all scholarly journals and publish about 64% of all scholarly articles.¹¹ This is a dramatic increase from the Victorian era in which societies dominated publishing with a small but “*significant proportion*” originating with commercial presses.¹²

The rapid growth of commercial origination of journals was accompanied by rapid increases in journal subscription prices. “*During the 16-year interval between 1986 and 2001, scholarly journals prices overall increased by 8.5 % per year, while the CPI grew by 3.4 % per year. . . .Journal prices jumped by 215%, the CPI just 64% during this period, grew twice as fast as health care prices.*”¹³ While many factors contributed to these price increases, recent research finds that the increasing concentration of commercial publishing was the major culprit.¹⁴

⁹ Ibid., p. 16.

¹⁰ Murdak, op. cit.

¹¹ Ibid. p. 45

¹² Larivière V, Haustein S, Mongeon P (2015) *The Oligopoly of Academic Publishers in the Digital Era*. PLOS ONE 10(6): e0127502. <https://doi.org/10.1371/journal.pone.0127502> p. 15.

¹³ David Shulenburg and Richard Edwards, “*The High Cost of Scholarly Journals (And What to do About It)*,” pp.10-19, in *Change*, (November/December 2003).

¹⁴ Lewis G. Liu and Harold Gee, “*Determining Whether Commercial Publishers Overcharge Libraries for Scholarly Journals in the Fields of Science, Technology, and Medicine, with a Semilogarithmic Econometric Model* Volume 87, Number 2 | April 2017 *The Library Quarterly* Commercial publishers derive 102% of return beyond cost of nonprofit publishers.

Conversion to the all-digital format marked by *Postmodern Culture*'s entry in 1990 and followed within a decade by digital conversion of almost all scholarly journals had two major adverse impacts: *"the top commercial publishers have benefited from the digital era, as it led to a dramatic increase in the share of scientific literature they published [and] to . . . a greater dependence by the scientific community on these publishers."*¹⁵

But more importantly, *Postmodern Culture*'s debut signaled the end of the **tyranny of the page limit** as a constraint on the amount of scholarly communications a journal could publish as paper, printing and mailing cost ceased to be limiting factors. With the lifting of these constraints the need to make the toughest judgments about the relative qualities of manuscripts competing for scarce space was lifted. The mega journal was a natural outgrowth.¹⁶

arXiv demonstrated that serious scholarship could be made available to the academy prior to refereeing without contaminating scholarship and thereby impeding scholarly progress. In many ways, *arXiv* was the progenitor of the Open Access movement. Citations directly from *arXiv* have become common and there are now many disciplinary-based competitors.

The **open access** movement began in the late 1980s in response to the concern that out of control journal price inflation would restrict access to the literature for students and scholars. But more is meant by open access than the right to read the literature for free. In the words of the Budapest Open Access Declaration:

*By 'open access' to this literature, we mean its free availability on the public internet, permitting any users to read, download, copy, distribute, print, search, or link to the full texts of these articles, crawl them for indexing, pass them as data to software, or use them for any other lawful purpose, without financial, legal, or technical barriers.*¹⁷

kathleen fitzpatrick in her 2012 keynote address to the Council of Editors of Learned Societies, elegantly made clear that open access was not merely an attempt to make the literature more affordable. Ensuring one's work appeared in an open access arena is

"... 'giving it away,' [is] ... paying forward knowledge that one likewise received as a gift, . . . [a] best ethical practices of scholars and educators.

¹⁵ Ibid. p.9.

¹⁶ Ware and Mabe, p. 99,100.

¹⁷ Leslie Chan et al., 'Read the Budapest Open Access Initiative,' *Open Society Foundations* (14 February 2002): paragraph 3, available at http://www.soros.org/open_access/read

*. . . in an ethical, voluntary scholarly community . . . grounded in the obligation we owe one another, an obligation that derives from what we have received.*¹⁸

The open access movement has grown from miniscule to massive. It has spawned thousands of journals, with variations of OA known by the colors of green, gold, hybrid, bronze and black (pirated). These free-to-reader types contrast with journals that can be accessed by readers only through a paywall known as “closed” articles.

There are now 885 mandates world-wide that require researchers to ensure that their published manuscripts are available through open access either immediately or after a specified period of delay.¹⁹ These mandates include a U.S. Presidential executive order affecting publications and data arising out of major U.S. Government-funded research, as well as those emanating from many national research organizations, large private research funders such as Wellcome and Gates, and universities including KU and Harvard, etc.²⁰ Many university, funding agency, foundation and disciplinary archives are maintained to hold these research outputs.

The result of the availability of the open access movement and the venues and mandates it has spawned is that 47% of searches for recent scholarly articles produce free access to them (through legitimate, legal sources). The proportion of freely accessed articles is growing rapidly as the mandates mature and force delayed access articles to morph into open access.²¹

Problems with the Scholarly Literature

Thus, this is a time when access to the findings of scholarly research appears to be easy, but that appearance is often deceptive. While scholarly “research” is in many ways more accessible and abundant in quantity than ever before, caution must be exercised in accepting published scholarly research at face value. Those seeking the results of research had best do so with *caveat emptor* as their guide (whether they are buying the research themselves or getting it for “free”).

¹⁸kathleen fitzpatrick, *Giving It Away: Sharing and the Future of Scholarly Communication Journal of Scholarly Publishing* July 2012 doi: 10.3138/jsp.43.4.347

¹⁹ <http://roarmap.eprints.org/dataviz2.html> accessed on March 22, 20019

²⁰ Piwowar H, Priem J, Larivière V, Alperin JP, Matthias L, Norlander B, Farley A, West J, Haustein S. 2018. *The state of OA: a large-scale analysis of the prevalence and impact of Open Access articles*. *PeerJ* 6:e4375 <https://doi.org/10.7717/peerj.4375> Published February 13, 2018

²¹ Ibid.

Such buyer beware advice would have seemed inappropriate 20 years ago. While Senator William Proxmire had the practice of monthly awarding a Golden Fleece prize to a piece of research he deemed to be trivial, unimportant, or a squandering of public money,²² few questions from others about the legitimacy of research articles in scholarly journals were to be found. Wise counsel once was to go to refereed scholarly journals to find the best research of scholars and to trust (of course with appropriate academic skepticism) what one found there.

But the conclusion today is very different:

*The reader of an article has **no way of knowing** whether an individual article has been peer reviewed, and if so, to what standard, without a good working knowledge of the journals in a field. Lay readers will typically not have this knowledge, but even expert researchers will encounter articles from outside their domain, and journals with otherwise good peer review do not always clearly label (at the article level) which articles have been peer reviewed and which not.*²³

An incomplete listing of the problems one encounters with the allegedly refereed literature include:

- **Corruption of the Refereeing Process.** Some systematic efforts have been uncovered that succeeded in getting confederates of the author to be reviewers of the author's manuscript.²⁴ The lack of transparency when an author cites her/his own work is known to be a corruptor of the double-blind refereeing process. Unfortunately, the catalogue of ways the process has been corrupted is now long.
- **Omission of negative results.** Across all fields of research (but particularly notable in drug trials) the incentive to publish negative findings is low and they go underreported. In a particularly egregious case, negative trials of the drug compound Tamiflu went unreported, leading to dependence world-wide on a drug of limited capability in combatting flu epidemics.²⁵
- **Falsification of research data and research results.** During the last decade 15,698 published papers have been retracted by journals.

²² William Proxmire, *Senator Who Abhorred Waste, Dies*, *New York Times*, Dec. 15, 2015

<https://www.nytimes.com/2015/12/15/national/william-proxmire-senator-who-abhorred-waste-dies.html>

²³ Ware and Maybe p. 51.

²⁴ Ibid. p.49

²⁵ For a particularly egregious case see: Yogendra Kumar Gupta, Meenakshi Meenu, and Prafull Mohan "The Tamiflu fiasco and lessons learnt", *Indian J Pharmacol*. 2015 Jan-Feb; 47(1): 11–16

During this past year 329 were retracted.²⁶ This is a small fraction of the close to 30 million articles published during the last decade, but reliance on even a single article with falsified results can have long run negative effects. The example of the Wakefield, et. al. study that incorrectly linked childhood vaccine and autism is the prime example.²⁷

- **Reproducibility.** John P. A. Ioannidis shocked the academy in 2005 with his explanation of why **most** published research findings are false.²⁸ His work led to literally hundreds of examinations of past studies to see if they could be replicated. Studies published in 2011 and 2012 on a class of clinical drug trials found that their key findings could be reproduced in only 11% and 25% of those studies.^{29,30} In 2015, the Open Science Coalition replicated 100 studies in three top ranked psychology journals and reported “*Thirty-six percent of replications had significant results*”³¹. Such findings, differing in magnitude, are common in every field. While many explanatory hypotheses have been offered, ranging from statistical to fraud, the public damage to the credibility of scientific research from the reproducibility crisis is significant.
- **Research that deliberately spoofs legitimate research.** Spoofs submitted to and published by “refereed” journals have become a popular way of exposing sloppy refereeing or the lack of refereeing. “*The conceptual penis as a social construct*” and “*Transgressing the Boundaries: Towards a Transformative Hermeneutics of Quantum Gravity*” serve this useful function.³² However, scholars who cite them as legitimate because they appear in refereed journals are likely to be less amused by the cleverness of their authors.

²⁶ Retraction Watch <http://retractiondatabase.org/RetractionSearch.aspx> accessed on March 20, 2019

²⁷ The Editors of The Lancet COMMENT | [VOLUME 375, ISSUE 9713](#), P445, FEBRUARY 06, 2010 Retraction—Ileal-lymphoid-nodular hyperplasia, non-specific colitis, and pervasive developmental disorder in children Published: February 06, 2010 DOI: [https://doi.org/10.1016/S0140-6736\(10\)60175-4](https://doi.org/10.1016/S0140-6736(10)60175-4)

²⁸ John P. A. Ioannidis *Why Most Published Research Findings Are False* PLOS Medicine August 30, 2005 <https://doi.org/10.1371/journal.pmed.0020124>

²⁹ C. G. Begley, L. M. Ellis, *Raise standards for preclinical cancer research*. *Nature* 483, 531533 (2012).

³⁰ F. Prinz, T. Schlange, K. Asadullah, *Believe it or not: How much can we rely on published data on potential drug targets?* *Nat. Rev. Drug Disc.* 10, 712713 (2011)

³¹ Aarts et al. (Open Science Coalition), *Estimating the reproducibility of psychological science* *Science*, 28 Aug 2015:Vol. 349, Issue 6251, aac4716 DOI: 10.1126/science.aac4716

³² For examples see Lindsay, J., & Boyle, P. (2017). *The conceptual penis as a social construct*. *Cogent Social Sciences*, 3(1), 1330439. <https://doi.org/10.1080/23311886.2017.1330439> and “*Transgressing the Boundaries: Towards a Transformative Hermeneutics of Quantum Gravity*” “Alan D. Sokal’s hoax”, *Social Text* #46/47, pp. 217-252 (spring/summer 1996)

- **Continuing Unsustainable increases in Journal Subscription Costs.** Journal subscriptions constitute about one-third of all research university library expenditures. While calculation of the rate of increase is difficult because of secrecy and bundling of subscriptions, my calculations show that library expenditures for serials has grown at 5.3% annually over the last decade while library budgets have grown at 1.8%. **Should these rates of increase continue, in 2045 all of the library budget would be consumed by serials.** Clearly this is unsustainable.
- **Growth of Predatory Journals.** In its cryptic, proper English *The Economist* in late 2018 revealed: “*Of late, however, this habit of according importance to papers labelled as “peer reviewed” has become something of a gamble. A rising number of journals that claim to review submissions in this way do not bother to do so.*” . . . Cabells’ list includes numbers 8,700 such “predatory journals”.³³

Predatory journals work to disguise their nature by copying the look, feel and text from legitimate journals, using titles that are cloyingly similar to those of legitimate journals and by creating fake “journal impact factors” and other such statistics. Their publishers claim their articles are refereed but never have undergone refereeing. Nonetheless, they are identified as such by the firm Cabell and by accessing the Directory of Open Access Journals.³⁴

Shen and Björk found that “... *predatory journals have rapidly increased their publication volumes from 53,000 in 2010 to an estimated 420,000 articles in 2014, published by around 8,000 active journals.*”³⁵ The problem is serious and voluminous enough to raise concern about the legitimacy of scholarly journals in the minds of the sophisticated press. If the Shen and Björk estimate is correct, approximately 15% of all “scholarly” journal articles are not legitimate.

The difficult question is why scholars would submit their scholarship to illegitimate journals. Pamela Drake ventures a couple of answers: “*One reason may simply be confusion or lack of*

³³ Publish and don’t be damned: Some science journals that claim to peer review papers do not do so *The Economist* Print edition | Science and technology June 23rd 2018

³⁴ <https://www.doaj.org/> DOAJ (Directory of Open Access Journals) **DOAJ** is a community-curated online directory that indexes and provides access to high quality, open access, peer-reviewed journals.

³⁵ Cenyu Shen and Bo-Christer Björk ‘Predatory’ open access: a longitudinal study of article volumes and market characteristics *BMC Medicine* 2015 **13**:230 <https://doi.org/10.1186/s12916-015-0469-2>

knowledge about quality academic journals. But another reason is more worrisome - the desire to get published and with such a brief "turnaround" time. The later reason may be due to promotion or merit raise. . ."³⁶

Predatory journals all charge fees (so called "article processing charges" or "APCs") directly to authors for publishing in them. I warned about the possibility that charging authors to get papers published would likely lead to adverse consequences in my 2003 presentation to the Max Planck society

*An author charge plan to support journals would carry an unfortunate message to authors and their funding agencies. They would receive the message that publications were undesirable by-products of research in need of disposal, not dissemination, [hence, the title of the presentation Scholarly Communications is not Toxic Waste.] . . . Under the laws of most countries, toxic waste has to be properly disposed of by its creator, regardless of the cost. Such laws properly provide incentive to producers to produce as little toxic waste as is compatible with production of the product. Is this the message we want to give researchers, their universities or their funding agencies? Just as additional research funding produces more research and additional rewards promote publication, negative monetary reinforcement for publication would surely reduce publication or force the use or creation of some other outlet for research results.*³⁷

It appears that my prediction that APCs would lead to questioning the legitimacy of research published in such journals has at least in some cases has been proved correct.

Note the confirming judgment from *The Economist* in their explanatory piece on predatory journals:

"Fuelling the boom is a change in the way many journals make money. . . many . . . now charge authors to publish their papers... A journal that need not induce readers to pay can publish rubbish, as long as authors will pay for the presumed prestige, says Elizabeth Wager, a British consultant on academic publishing and editor

³⁶Pamela Peterson Drake *Predatory journals, open-access, and the effect on publishing in finance* James Madison University, SSRN January 2019

³⁷ David Shulenburger, *Scholarly Communications is Not Toxic Waste: Lessons Learned Prepared for the Open Access to Knowledge in the Sciences and Humanities Conference*, Max Planck Society, Harnack Haus, Berlin, October 2003

*of Research Integrity and Peer Review, a journal. The result has been a flood of “atrocious” papers . . . ”*³⁸

Part of a Larger Pattern?

This listing is neither an exhaustive cataloging of such problems nor an impeachment of the legitimacy of all scholarly literature. Well-refereed scholarly journals still represent the gold standard. Rather, the growing list of concerns is indicative of the ills well-established industries manifest when they receive major jolts from rapid expansion of demand or the appearance of radically new technology. In the case of the scholarly communications “industry” there were three such jolts; one from the expansion of federal research funding in the 1960s and 1970s, another from the rapid entry of commercial presses into what had been a largely society publishing environment and the last from the post-1990 digitization of scholarly journals.

The recent book by Tom Wheeler, *From Gutenberg to Google: The History of our Future* (Brookings Press 2019)³⁹ recounts what the introduction of the printing press, railroad, telegraph, telephone and internet meant to predecessor industries. From his study of the social and economic disruptions introduced by these technologies, Wheeler uncovers a number of common effects. On the effect of the introduction of the press he writes:

*“Gutenberg’s discovery also demonstrates how connectivity alters the structure of authority. As the merchant printers’ distributed authority began to destroy controlled-access information silos, the disaggregation of centralized authority over ideas and institutions followed.”*⁴⁰

Similarly, scholarly literature’s three jolts dramatically reduced the authority of established scholarly societies to determine what standards were to be applied when judging publication worthiness.

And Wheeler observes that the disruptions don’t work themselves through systems quickly:

*“The printing revolution demonstrated a reality that persists today: A new network technology produces upheaval long before it produces stability.”*⁴¹

The perturbations of demand began affecting the market for scholarly work 70 years ago and the digital world’s effects became significant 30 years ago.

³⁸ “The Economist explains What are “predatory” academic journals?” *The Economist* October 7, 2018 <https://www.economist.com/the-economist-explains/2018/07/10/what-are-predatory-academic-journals>

³⁹ For a fascinating public lecture by Wheeler on his book see <https://www.youtube.com/watch?v=1eebHH0H0mE>

⁴⁰ Tom Wheeler, *From Gutenberg to Google: The History of our Future* (Brookings Press 2019) p. 858.

⁴¹ Ibid. 828

Change is still occurring at a very rapid rate. Wheeler's examination of the expanding "networks" created by the printing press, railroads and telegraph produced the following maxim that such growth results in concentration of economic power.

*"... its redirection of information from sheltered silos to an outward surge recast the nature of inquiry, economics, and social structures. . . . While networks moved outward structurally, the economic activity they enabled moved in the opposite direction. Businesses seized on the network to build new centralized economic power. Rockefeller's Standard Oil, Carnegie Steel, Montgomery Ward and Sears, Roebuck mail order, Swift and Armour Meatpacking, and others built centralized empires using the railroad and telegraph. Today we see the same pattern."*⁴²

And the "network" expansion in scholarly communications followed this pattern. An exhaustive investigation of this development of oligopoly by Larivière, et. al., illustrates the rapid growth of concentration of scholarly publishing in the natural, medical and social sciences and humanities thusly: *"three publishers account for more than 47% of all papers in 2013: Reed-Elsevier (24.1%; 1.5 fold increase since 1990), Springer (11.9%; 2.9 fold increase), and Wiley-Blackwell (11.3%; 2.2 fold increase)."*⁴³ Ware and Mabe find that commercial publishers published about 65% of all scholarly articles in 2015.⁴⁴

The publishers have used their enlarged market share to produce abnormal profits. The profit margins of Springer and Reed-Elsevier are roughly triple the Standard and Poor's average profit margin of 10.7%⁴⁵ while Wiley's is comfortably above S&P's average. [Their 2017 profit margins are: Springer (37%)⁴⁶ Wiley (13%)⁴⁷ and Reed-Elsevier (31.1%).⁴⁸] These very high profit margins have been sustained for the last two decades.

Wheeler's conclusion is that such innovations generally do not have exclusively benign social outcomes and do not right themselves unless external intervention occurs. Each new technology he studied gave rise to concentrations

⁴² Ibid. 852

⁴³ Larivière V, Haustein S, Mongeon P (2015) *The Oligopoly of Academic Publishers in the Digital Era*. PLoS ONE 10(6): e0127502. <https://doi.org/10.1371/journal.pone.0127502>

⁴⁴ Ware and Mabe op. cit. p. 45

⁴⁵ <https://www.investopedia.com/ask/answers/041415/what-considered-healthy-operating-profit-margin.asp>

⁴⁶ https://www.axelspringer.com/data/2018/03/Annual_Report_2017.pdf

⁴⁷ <https://newsroom.wiley.com/press-release/all-corporate-news/wiley-reports-fourth-quarter-and-fiscal-year-2018-results>

⁴⁸ http://www.jaarverslag.com/assets/reports/JaarverslagCOM_Reed_Elsevier_Jaarverslag_2017.pdf

of economic power that required governmental regulation/control or legal action to rectify:

*“Historically, pioneers make the rules for the new territories they discover, until those rules begin to impinge on the well-being of the public. The antitrust laws were established precisely for this purpose: to create a countervailing force to corporate power.”*⁴⁹

Wheeler’s important book was issued near the 30th anniversary of the invention of the World Wide Web. Its inventor, Tim Berners-Lee, marked that 30th anniversary by delivering his views on the state of network. He saw in the Web an innovation that had had accomplished much but with “three sources of dysfunction”:

1. ***Deliberate, malicious intent***, such as state-sponsored hacking and attacks, criminal behaviour, and online harassment.
2. ***System design that creates perverse incentives*** where user value is sacrificed, such as ad-based revenue models that commercially reward clickbait and the viral spread of misinformation.
3. ***Unintended negative consequences*** of benevolent design, such as the outraged and polarised tone and quality of online discourse.⁵⁰

Berners-Lee’s observations represent a reinforcing, contemporaneous complement to Wheeler’s work. While both authors were focused more broadly than scholarly communication, their findings describe well the state of dysfunction I enumerate above.

Indeed, **malicious intent** is evident in the falsification of research results and the techniques predatory journals use to attract authors. **Perverse incentives** have produced the rapid growth of the entire literature, the unrelenting price increases of journals, its spread to predatory journals, the willingness of authors to contribute their work to such journals, the omission of negative results from the literature, some of the spread of grey literature, etc. Scholarly discourse on many campuses has become less than pleasant as fixes for the scholarly communications ills are proposed that reduce the advantage that some have gained as the system deteriorated.

A recent article on Elsevier’s wide range of acquisition in areas of publishing, archiving and sharing of work have provoked dark concerns about the possibilities of working out malicious intent. The article quoted Heather Joseph

⁴⁹ Interview with Tom Wheeler at the London Book Fair <https://www.publishersweekly.com/pw/by-topic/international/london-book-fair/article/79467-london-book-fair-2019-why-the-story-of-our-networked-world-is-a-story-of-upheaval.html>

⁵⁰ Tim Berners-Lee, 30 years on, what’s next #ForTheWeb? <https://webfoundation.org/2019/03/web-birthday-30/>

of SPARC who said, “they are . . . worried about one company's controlling so many tools that analyze not only the reach and performance of research but also the professors and institutions that produce it.”⁵¹ The scholarly article on which those comments were based directly implicates the successful efforts of Elsevier, Taylor and Francis and Wiley at “. . . vertical integration and the promotion of citation metrics . . . designed to increase the dependency of products, further monetize content ownership, and entrench established journals.”⁵² Malicious and perverse, indeed!

Berners-Lee's fix for the network systems dysfunctions mirrors Wheeler's in that he sees a need for active intervention by government to remedy them.

*“Governments must translate laws and regulations for the digital age. They must ensure markets remain competitive, innovative and open. And they have a responsibility to protect people's rights and freedoms online. We need open web champions within government — civil servants and elected officials who will take action when private sector interests threaten the public good and who will stand up to protect the open web.”*⁵³

Revitalizing the System

*The innovations created by new networks topple old institutions and accelerate the pace of life. The demands of the new and the absence of traditional moorings generate frustration and bewilderment.*⁵⁴ —Tom Wheeler

Frustration and bewilderment over the dramatic change in the scholarly communications field can be seen throughout the academy but I have been struck with the frequency with which articles have appeared in the mainstream press concerning the problems with scholarly research and literature. *The Economist*, *The New York Times*, *Washington Post*, *Financial Times*, *Guardian* and others have had frequent articles on the problems I recite above. Some of them conflate problems with scholarly research with problems with higher education in general. We ignore this unflattering press at our own peril. We must get on with restoring a healthy scholarly communications system.

⁵¹ Lindsay Ellis, *Elsevier's Presence on Campuses Spans More Than Journals. That Has Some Scholars Worried*. *Chronicle of Higher Education*, April 3, 2019 https://www.chronicle.com/article/Elsevier-s-Presence-on/246048?cid=pm&utm_source=pm&utm_medium=en&cid=pm

⁵² Alejandro Posada, George Chen. *Inequality in Knowledge Production: The Integration of Academic Infrastructure by Big Publishers*. Leslie Chan; Pierre Mounier. ELPUB 2018, Jun 2018, Toronto, Canada. <10.4000/proceedings.elpub.2018.30>. <hal-01816707> p. 14.

⁵³ Ibid.

⁵⁴ Wheeler, op. cit.

I believe that opening the scholarly communications system so that it is accessible to all can cure these ills. There are two major reasons to push for opening the scholarly communications system. The first is cogently summarized in the National Academies 2018 volume *Open Science by Design: Realizing a Vision for 21st Century Research*:

*“Openness increases transparency and reliability, facilitates more effective collaboration, accelerates the pace of discovery, and fosters broader and more equitable access to scientific knowledge and to the research process itself.”*⁵⁵

This National Academies consensus study was the result of a year’s work by a carefully selected panel of ten [including Donna Ginther, Professor of Economics and the Director of the Center for Science Technology & Economic Policy of KU]. It puts forth a series of actions that should be taken to “*move toward open science as the default for scientific research results.*” Of course, without a solid motivation for their recommendations, their recommendations would be unlikely to be realized, hence the work is well grounded in the conviction that openness accelerates the pace of discovery.

The second reason for recommending that we open the system rather than keeping it in its increasingly private closed form, is somewhat less lofty, more pecuniary in nature. kathleen fitzpatrick states it cogently:

*“The problem, of course, is that the more we close our work away from the public and the more we refuse to engage in dialogue across the boundaries of the academy, the more we undermine that public’s willingness to fund our research and our institutions.”*⁵⁶ fitzpatrick extends this argument from research funding to funding of higher education in general; “. . . the major crisis facing the funding of higher education is an increasingly widespread conviction that education is a private responsibility rather than a public good. **We wind up strengthening that conviction when we treat our work as private, by keeping it to ourselves.**”

I am convinced that the funding future of higher education in large part depends upon regaining the public’s confidence in our endeavors, including scholarly communications.

What principles would guide the opening of such a system? There are many models, but the set of principles proposed by the faculty of long-term open access leader MIT appeal:

1. Scholarly authors should retain copyright in their own work and full rights to reuse their work.

⁵⁵ National Academies of Sciences, Engineering, and Medicine. 2018. *Open Science by Design: Realizing a Vision for 21st Century Research*. Washington, DC: The National Academies Press. <https://doi.org/10.17226/25116>.

⁵⁶ kathleen fitzpatrick op. cit. p 353

- 2. Scholarly outputs should be openly available to readers everywhere, regardless of institutional affiliation or individual ability to pay.*
- 3. Data, code, and other supporting materials necessary to validate and/or replicate scholarly work should be openly available.*
- 4. Scholarly work should be openly available to computational analysis, and to algorithmic and machine learning applications and uses.*
- 5. The full life cycle of research should be part of the scholarly record, and therefore scholars should have the right to openly share early versions of articles and other publications in open preprint servers, institutional repositories, and/or open platforms, with no restrictions on subsequent publication choices.⁵⁷*

MIT's proposed principles for reform (like those proposed by the National Academy) include the outputs of scholarly communications as well as the inputs, e.g., "Data, Code and other supporting materials." While I did not directly address research input spawned difficulties in my recitation of the problems of scholarship, it should be obvious that many of the problems I listed cannot be resolved unless such input material is made available for examination. For example, dealing with the reproducibility and false data problems demand access to the data the researcher used.

Predatory journals and problems with refereeing are outed by complete transparency. Additionally, the lofty aim of "accelerating the pace of discovery" is furthered if one can reanalyze data sets and extend them. Clearly restoration of full confidence in the scholarly enterprise rests upon full transparency.

Concluding Recommendations

Righting the problems affecting scholarly communications will take time and coordinated activity. Where to begin this Augean Stables-size cleansing? I outline below the four tasks that I think should take priority.

Task 1-Strive to Make Research Available to Readers Everywhere. There are multiple approaches to making research available to readers everywhere regardless of institutional affiliation or ability to pay.

Many respected journals have found a way to become open access without charging for subscriptions or establishing APC charges to authors. They should

⁵⁷ Draft Recommendations of the MIT Ad Hoc Faculty Task Force on Open Access to MIT's Research March 16, 2019

<file:///C:/Users/shule/Documents/finances/MIT%20draft%20OA%20recommendations%20revised%20%20March%2016%202019%20v7.pdf>

be encouraged and multiplied but I do not see where adequate funding to convert the entire market to this model will come from.

But many commercial journals prefer the subscription model. They are satisfied with being “closed” journals whose content cannot be seen by those who are not covered by a paid subscription or by a paid fee for access to each article.

We know the unfortunate record of subscription rate increases over time; in an oligopolistic sellers’ market, the market power of the publishers has increasingly narrowed access. The subscription model is not one that will ensure access.

Other journals have chosen to eliminate subscriptions and charge every author for publication through the APC route for publishing in them.

While some have argued that flipping journals from subscriptions to APCs will serve to reduce the total cost of acquiring publication, there is no evidence that it has done so. I contest this reasoning on economic grounds that the APCs arrangement takes large libraries out of the buyer’s side of the market and replaces them with relatively powerless individual authors.⁵⁸ The powerful confronted by the weak lose only in fables. As I have put it elsewhere, “The cure of flipping to APCs is worse than the disease of subscriptions.”

Others have become hybrid journals, charging subscription rates to institutions and then offering the option to authors to pay for the right to have their articles immediately become open access by making an APC payment to them. What appears to be evolving in hybrid journals is that APCs paid by authors are *in addition to* the subscriptions paid by libraries. The funds thus extracted from the Academy are greater than the revenue received from APC-only, or subscription-only journals. No solution here!

Our future is one in which many journal forms and payment models will co-exist. The trick is to decrease excessive journal prices (however it is expressed) by increasing the bargaining power of libraries while reducing that of commercial publishers and of those societies who act greedily as though they were commercial publishers.

Recent events provide reason for optimism that libraries and other purchasers will effectively use the buying power they already have to reduce subscription charges and obtain open access in the process. The University of California System has attempted to negotiate a deal with Elsevier such that all of

⁵⁸ “Substituting Article Processing Charges for Subscriptions: The cure Is Worse than the Disease”. <https://www.arl.org/storage/documents/substituting-apcs-for-subscriptions-20july2016.pdf> .

its faculty manuscripts published in Elsevier journals would become open access to all readers. IF UC succeeds in getting such agreement with Elsevier, others could attempt to follow that route.

Large buyers of journals have market power to reduce prices if they are actually willing to reject the big deals offered to them by publishers and subscribe only to individual journals or pay for ad hoc article access as needed by their faculties. Recent showy refusals to buy one commercial publisher's big deal by the University of California System and the Norway Directorate of ICT⁵⁹, the additional seven cancellations of "big deals in 2019; six in 2018 and 13 in 2017 (including KU's withdrawal from the deal with Springer-Nature)⁶⁰ may ultimately compel publishers to reduce price increases to sustainable levels.

Librarians cannot exert their bargaining power unless faculty understand and support their efforts. Given the straightened nature of university budgets, it is clearly in faculty interest to support such library efforts and thereby reduce the unnecessary strain that excessive subscription prices place on university budgets.

On Sept 4, 2018, a coalition of European research funders and foundations supported by the European Commission and the European Research Council (ERC) announced what is known as Plan S.⁶¹ The first principle of the plan is that, *"By 2020 scientific publications that result from research funded by public grants provided by participating national and European research councils and funding bodies, must be published in compliant Open Access Journals or on compliant Open Access Platforms."*

If Plan S succeeds in getting a substantial number of journals to join their plan most European scholarly papers will be published open access. Plan S also includes a mechanism for controlling the price publishers charge. A unique element in Plan S is that journals in becoming "compliant" will accept cost controls on the APCs, which become their revenue source: *"Where article processing charges (APCs) apply, Coalition S will contribute to establishing a fair and reasonable APC level, including equitable waiver policies, that reflects the costs involved in the quality assurance, editing, and publishing process and how that adds value to the publication."*⁶² The compliant level of APC has not been announced so it is not clear as of yet what savings Plan S might produce.

Task 2- Focus Evaluation on the real contribution articles make. Journal bargaining power and hence the prices they charge have an inextricable link to faculty evaluation practices. To break this link, a first priority must be to return

⁵⁹ *Inside higher Education*, March 13, 2019

⁶⁰ <https://sparcopen.org/our-work/big-deal-cancellation-tracking/>

⁶¹ <https://www.coalition-s.org/about/>

⁶² https://www.coalition-s.org/wp-content/uploads/271118_cOAlitionS_Guidance.pdf

evaluation of faculty research to honest and direct assessment of the contribution faculty articles make to the advancement of science and to the formation of policy.

While our written words in evaluation policies appear to say such is already our basis for evaluation, my experience is that we too often permit bibliometric indicators to serve as proxies for direct assessment of worth. *The counting of papers indexed by large-scale bibliometric databases— which mainly cover journals published by commercial publishers, . . . creates a strong incentive for researchers to publish in these journals, and thus reinforces the control of commercial publishers on the scientific community.*⁶³

The market power of journals is mightily enhanced when we use “*bibliometric indicators such as the Journal Impact Factor (JIF)*” in faculty evaluation.⁶⁴ We seized upon measures such as JIFs as a proxy for an article’s quality. Doing so apparently has its basis in reasonings that articles appearing in publications with a high number of citations per article will somehow get the same sort of attention from readers that the journal’s articles on-average receive. But research has shown that a relatively small number of articles in high impact journals receive a large portion of their citations and that many articles are very sparsely cited; thus, **a journal’s impact factor has no predictable relationship to the impact an article within it will have.**

The advice of the National Academy report is to judge the quality and likely impact on the field of each article and not rely on short-cut bibliometric measures.⁶⁵ The San Francisco Open Research Assessment Declaration is a particularly well respected and reasoned plea never to use such bibliometrics to judge the merit of individual researchers or the contribution made by individual articles.⁶⁶

Goodhart’s Law goes to the essence: when any statistical measure is used to control or guide human behavior, “any observed statistical regularity will tend to collapse once pressure is placed upon it for control purposes.”⁶⁷ While he

⁶³ Larivière V, Haustein S, Mongeon P (2015) *The Oligopoly of Academic Publishers in the Digital Era*. PLoS ONE 10(6): e0127502. doi:10.1371/ journal. pone.0127502, p. 15

⁶⁴ National Academies, op. cit. p. 37

⁶⁵ Ibid. pp. 37, 38

⁶⁶ <https://sfedora.org/read/>

⁶⁷ See Goodhart’s Law: Its Origins, Meaning and Implications for Monetary Policy by K. Alec Chrystal (City University Business School, London) and Paul D. Mizen (University of Nottingham) *Prepared for the Festschrift in honour of Charles Goodhart* 15-16 November 2001 at the Bank of England.

https://cyberlibris.typepad.com/blog/files/Goodharts_Law.pdf

developed that law in an examination of English monetary policy, it has been applied to examinations of the university assessment process and other contexts.⁶⁸

In spite of the warnings about the use of JIFs in evaluation, a particularly egregious use of JIFs for rewarding faculty has recently been reported; a research article⁶⁹ reports that very significant monetary rewards are given to faculty members at top Chinese research universities for publishing in high impact journals. Average payments to faculty members in the 100 universities in the study are reported to be \$43,783 in 2016 for publishing a paper in *Nature* or *Science*, \$3,513 for publishing in *PNAS* and \$2,983, for publishing in the *MIS Quarterly*. The highest payment reported at a single university was of \$165,000 for a *Nature* or *Science* publication.⁷⁰

During the 2006-16 decade in which the researchers surveyed Chinese university article payment practices, China's share of published science and engineering scholarly articles grew from 12.1% to 18.6% of the world total. (while the US share shrank from 24.4% to 17.8%.)⁷¹ Some of this growth is likely attributable to the incentive payments but China also was investing heavily in its best universities to bring them to world class during the same period.

I do not single-out the Chinese for the practice of rewarding faculty for publishing in journals where JIFs are high, as the practice in more subtle forms is common elsewhere. Many faculty members in the U.S., Europe and elsewhere have been hired, promoted and awarded distinguished chairs for ringing the same high-impact bells and the monetary rewards they have received (over a longer period and generally in the form of higher annual salaries and other benefits) have been at least at and probably above the level of those attributed to the Chinese. *The Economist's* reporting of the widespread practice of rewarding faculty based on these metrics also notes the inclusion of these same questionable metrics of

⁶⁸ Marilyn Strathern (1997). 'Improving ratings': audit in the British University system. *European Review*, 5, pp 305-321 doi:10.1002/(SICI)1234-981X(199707)5:33.0.CO;2-4

⁶⁹ [Wei Quan](#), [Bikun Chen](#), [Fei Shu](#), (2017) "Publish or impoverish: An investigation of the monetary reward system of science in China (1999-2016)", *Aslib Journal of Information Management*, Vol. 69 Issue: 5, pp.486-502, <https://doi.org/10.1108/AJIM-01-2017-0014>

⁷⁰ *Publish Or Impoverish: An Investigation Of The Monetary Reward System Of Science In China MIT Technology Review* (1999-2016) arxiv.org/abs/1707.01162

⁷¹ Calculated from National Science Board, Science and Engineering Indicators 2016, Table 5-26-S&E articles in all fields combined, by region/country/economy: 2000–13

quality in world-wide university rating schemes; universities encourage faculty to focus on maximizing their metrics as a means of advancing university ratings.⁷²⁷³

We will only encourage publishers of journals with high impact factors to raise subscription prices and APCs if we persist in financially rewarding faculty for publishing in their journals. As Pogo said, “We have met the Enemy and he is us.”⁷⁴ It would be far better to encourage faculty to place their publications where they will make the greatest impact on the development of their fields or on public policy. As the Academy put it: “*As long as universities and funders rely heavily on the signals provided by journals with the highest JIFs, which overwhelmingly tend to be subscription-based, those journals will continue to dominate high- quality submissions, and their publishers will continue to have considerable leverage in negotiating access agreements with research libraries.*”⁷⁵

Task 3-Initiate Government action to reestablish the rules of the road needed for the scholarly enterprise to thrive

Just as with the three network expansions that Tom Wheeler analyzed, the network extension in scholarly communications has resulted in rapid and unhealthy growth of commercial providers as well as permitting thieves and charlatans to enter the scholarly communications market. Governmental actions of the four types detailed in the following are needed to restore competition and to eliminate illegal activity.

- Vigorous prosecution of those predatory journal activities that are used to deceive others. The FTC has filed cases against a firm for various predatory practices that resulted in a temporary injunction against the firm⁷⁶ and on April 3, 2019 succeeded in getting a federal judge in Nevada to fine that fund \$50 million. (The firm is located in India so it may be difficult to collect the fine.)⁷⁷ HHS has also acted to prohibit predatory publishers from posting papers they publish on its site. Such actions to date have had only minor impacts on the predatory industry largely because standards for acceptable practices vary so widely within the legitimate publishing industry. Nonetheless, vigorous enforcement should continue as a means

⁷² *Seizing the laurels Tsinghua University may soon top the world league in science research Economist* November 17, 2018 <https://www.economist.com/china/2018/11/17/tsinghua-university-may-soon-top-the-world-league-in-science-research>

⁷³ See Alejandro Posada op. cit. pp, 14,15, for a thorough discussion of how these metrics are designed to affect university incentives.

⁷⁴ Walt Kelly, Pogo daily Strip *Earth Day* 1971, Publishers: [Simon & Schuster](#), [Fantagraphics Books](#), [Gregg Press](#), [Eclipse Comics](#), Spring Hollow Books

⁷⁵ National Academies op. cit. p. 113

⁷⁶ <https://www.ftc.gov/system/files/documents/cases/160826omicscmpt.pdf>

⁷⁷ Gina Kolata “Predatory Publisher is Fined \$50 Million” *New York Times*, April 5, 2019 p. B25

of defining standards and, at a minimum, forcing predatory industry actors to become more transparent.

- Ensure that net neutrality is reestablished so that all have equal access to the internet. The FTC in 2015 adopted net neutrality to ensure that all had access to the internet on an equal basis; the FTC reversed that decision in 2018. Because commercial publishers are such large users of the internet, it is conceivable that they could purchase access priority and disadvantage smaller for-profit and non-profit presses. Reestablishment of net neutrality, a question now before the courts, would help preserve a level playing field.⁷⁸
- Break up the very large firms in the market and prohibit other firms from exercising undue market power. Antitrust action against very large commercial publishers would appear to be justified because of the “. . . clear correlation between mergers and journal price increases in excess of already high rates of inflation.”⁷⁹ However, antitrust cases in the U.S. are typically based on a company’s holding of an excessively large share of a market, but, “because the DOJ defines the publishing market broadly, it is difficult to prove that STM publishers have the kind of concentration that typically characterizes a monopolistic market.”⁸⁰ There is a growing recognition that such standards are not appropriate in modern network-based industries. Perhaps efforts such as those by Senator Klobuchar and colleagues to modernize antitrust standards and enforcement will provide leverage to eliminate growing market dominance of commercial publishers.⁸¹
- Enact the existing executive order that requires researchers who receive grants from large federal funding agencies to make articles flowing from their funded research open access. The 2013 White House Office of Science and Technology Policy executive order remains in effect at this writing and is serving scholars well. That executive order could be rescinded by the president or modified in such a manner that it would be less effective. To insure public deposit of articles arising from federal research on a more permanent basis, the substance of the executive order should be written into federal law.

⁷⁸ <https://www.publishersweekly.com/pw/by-topic/international/london-book-fair/article/79467-london-book-fair-2019-why-the-story-of-our-networked-world-is-a-story-of-upheaval.html>

⁷⁹ Lee C. Van Orsdel Antitrust issues in scholarly and legal publishing Report on an invitational symposium in Washington, D.C. <https://www.arl.org/storage/documents/publications/iaa-symposium-report-feb2005.pdf> p. 375

⁸⁰ Ibid. p. 376

⁸¹ <https://www.klobuchar.senate.gov/public/index.cfm/news-releases?ID=A952CE13-DD98-4E27-8BBA-CACE520AF2EB>

Task 4- Reaffirm the Values of the Academy and Incorporate them into the training of new scholars.

The National Academy study rightly stresses that achieving Open Science depends upon successful ongoing efforts to incorporate open science into our every activity.⁸² We are far from this ideal. It appears to me that many of the ills of the academy are rooted in the too frequently observed self-promotion of one's career at the expense of the obligation to "sift and winnow," of the monetizing of one's creation and of a growing "what's-in-it-for-me attitude." These behaviors are manifested

- in those who create predatory journals and those who knowingly contribute articles to them;
- in scholarly associations that charge extraordinary prices for subscriptions to their journals and undermine the process of knowledge creation in the process;
- in for-profit corporations who by high subscription prices lock the scholarship they publish away from those who cannot afford access and enjoy unconscionably high profits from their enterprise;
- in setting above cost-recovery APCs that ensure that those from financially strapped universities have a reduced chance to publish their work;
- in scholars who submit their work for publication in journals that are not fully accessible to the academy and the broader society that paid for their salaries and the support of their research;
- in scholars who fail to support the scholarly enterprise by regularly accepting invitations to serve as referees from reputable journals;
- in "scholars" who have any part in efforts to subvert the integrity of the refereeing process;
- in scholars who seek only to publish positive results of their research and hide negative results and in journals whose acceptance patterns encourage such behaviors;
- in scholars who engage in "sloppy" science and do not specify their methods in sufficient detail so that others can replicate them.

In this listing I purposely group some behaviors that are commonplace among scholars and generally not questioned with other behaviors that are readily condemned by all. This may strike some as inappropriate. But when judged against what ought to be rather than that to which we have become accustomed, in my mind at least, the behaviors listed adhere.

⁸² National Academies op. cit. p. 98

Henry Rosovsky concludes his marvelous book *The University, An Owner's Manual* with his observations about perceptions created by behaviors such as those I have discussed.

*“And then the public sees us, from time to time, in the press, as falsifiers of scientific evidence (cheaters!), money-hungry . . . and occasionally even as unpatriotic. I have compared us to judges and priests-attached to the dignity conferred by our robes-but academic behavior does not always conform to these ideal standards. That is a breeding ground for criticism.”*⁸³

Rosovsky's book's last words to us contrast rationalizations of our behavior and the standard to which we ought to hold ourselves:

*“To our many critics I say: . . . what at first glance appears evil may be insignificant, innocent, or reflection of wider social mores. To ourselves I say: do not risk self-satisfaction; strive for greater perfection; make the gap between ideal and reality as small as possible.”*⁸⁴

In the spirit of Rosovsky I suggest that we reaffirm the high values to which the academy aspires and resolve that in our research endeavors we ensure to strive for perfection. We should redouble our efforts to ensure that graduate students understand these standards when they enter their studies and learn from our words and examples that we expect their behaviors to exhibit those ideals.

If we do this, we will practice Open Science and as we do so I believe that the ills of scholarly communication that I have described above will be ameliorated. Let us strive for greater perfection.

⁸³ Henry Rosovsky, *The University, An Owner's Manual*, WW Norton and Co. 1990, p. 299

⁸⁴ *Ibid.* 299